B.R. Ambedkar Bihar University, Muzaffarpur
Directorate of Distance Education
Subject- Mathematics

P.G. 4th Semester Examination 2015 (Session 2013-15)

Paper – 13 (Fluid Dynamics)

1. Define velocity at a point, stream lines and path lines.
2. Obtain equation of continuity in Cartesian form.
3. What is velocity potential and velocity vector? Discuss it obtain eqv. of continuity is vector form.
4. Obtain equation of continuity in polar coordinates.
5. Discuss the equation of continuity in spherical coordinates.
6. Show that the equation of continuity reduces to Laplace equation when the liquid is compressible and irrational.
7. Discuss velocity vector and boundary surface in detail.
8. What is velocity potential? Show that surfaces exist which cut stream lines orthogonally if the velocity potential exists.
9. State & prove Bernoulli's theorem for steady fluid motion in a conservative field of force.
10. State & prove Kelvin's circulation theorem.
11. Show that in two dimensional irrational motion, stream function and velocity potential satisfy Laplace's equation.
12. Derive Euler's dynamical equation of motion.
13. State & prove Stoke's theorem.
14. State & prove Kelvin's minimum energy theorem.
15. Establish the relation between stress and the rate of strain for a real fluid. Hence obtain Navier-Stroke equation of motion.
16. Define two dimensional source & sink. Find out complex potential of a surface of strength m at the origin.
17. Discuss motion of fluid between rotating coaxial circular cylinder.
18. Discuss Kinetic energy of a rotating Elliptic cylinder.

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Paper – 14

(i) Discuss the origin and the development of O.R.

(ii) Explain in detail the main characteristic of O.R

(iii) Explain the scope of operation research.

(4) Define the line, hyper plane and convex set

(5) A hyperplane is a convex set.

(6) Prove that set of feasible solution of L.P.P is a convex set.

(7) Find the dual of the following primal problem

Min $Z = 2x_2 + 5x_3$

subject to

$x_1 + x_2 \geq 2$

$2x_1 + x_2 + 6x_3 \leq 6$

$x_1 - x_2 + 3x_3 = 4$

and $x_1, x_3 \geq 0$

(8) Explain the concept of degenerancy in simplex method.

(9) Write down the general form of an optimal solution.

(10) Use dual simplex method to solve

Min $Z = 3x_1 + x_2$

Subject to

$x_1 + 2x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

$x_1, x_2 \geq 0$

(11) Write a short note on characteristic of game theory.

(12) Use matrix method to solve a game whose pay off matrix is

$$\begin{bmatrix} 3 & 6 \\ 5 & 5 \\ 9 & 3 \end{bmatrix}$$

(13) Minimize

$Z = y_1^2 + y_2^2 + y_3^2$

Subject to

$y_1 + y_2 + y_3 \geq 15$

and $y_1, y_2, y_3 \geq 0$

(14) Prove that the dual of the dual of a given primal is the primal.

(15) Write a short note on sensitivity analysis

(16) Define following

(i) Two person games

(ii) Pay off matrix

(iii) Strategy

(iv) Zero sum and non zero sum game

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P.G. 4th Semester Examination 2015 (Session 2013-15)

Paper – 15 (Computer Programming)

1. Write a program in C to accept matrices (2 x 2) and add them.
2. Write a program in C to check whether a number is even or odd.
3. Write a program to enter three numbers and find the smallest of them.
4. Write a program to find the factorial of a given number.
5. Write a program in C to accept four numbers and find the greatest and smallest number.
6. Write a program in C to point the Fibonacci series up to 10 terms by using recursive function.
7. Write a program in C to accept a line of text and count the number of vowels, consonants and words.
8. What do you mean by Algorithm & Flow chart? Write down an algorithm to check whether a given number is divisible by 7 or not. Also draw the flow chart.
9. What is an array? Explain the types of array with suitable examples.
10. What are pointers? Explain the features of pointer with the help of examples.
11. Discuss functions with suitable examples.
12. What are the similarities and difference between structures and union?
13. Explain linear and binary search with suitable examples.
14. Write notes on any three of the following:
    a. If else statement
    b. Mathematical operator
    c. Equality operator
    d. Assignment operator.
    e. File management in C.
    f. C Preprocessor.

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Paper – 15 (Advance Topology)

1. Define countably compact space with an example and show that every compact space is countably compact but the converse is not true.
2. Define sequentially compact space with an example and show that energy sequentially compact space is countably compact but the converse is not true in general.
3. A subspace of a totally bounded matric space is totally bounded.
4. Define totally bounded matric space and prove that a subspace M of a metric space X is totally bounded iff for any $\in > 0$, there exist a finite subset A of X such that $M \subseteq U_{x \in A} S_{\in}(x)$.
5. A totally bounded metric space is separable.
6. State and prove Lévesque covering lemma.
7. State & prove Arzela-Ascoli's theorem.
8. State and prove Weierstrass approximation theorem.
9. State & prove Stone-Weierstrass theorem.
10. State and prove extended stone-Weierstrass theorem.
11. Every filter on a set X is contained in an ultra-filter on X.
12. A topological space X is compact if any one of the following two equivalent statements is satisfied.
    (i) Every filter on X has a cluster point.
    (ii) Every ultra-filter on X converges.
13. Prove that every filter on a set X is contained in an ultra-filter on X.
14. State and prove Tychonoff's theorem on product of compact spaces.
15. A real valued continuous function on a compact metric space is bounded and attains its founds.

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